in a state of high chemical tension, will, by their tendency to develope those vibrations, either determine the explosion of that substance, or at any rate greatly aid the disturbing effect of mechanical force suddenly applied, while, in the instance of another explosion, which developes vibratory impulses of different character, the mechanical force applied through its agency has to operate with little or no aid, greater force, or a more powerful detonation, being therefore required in the latter instance to accomplish the same result.

Instances of the apparently simultaneous explosion of numerous distinct and even somewhat widely separated masses of explosive substances (such as simultaneous explosions in several distinct buildings at powder-mills) do not unfrequently occur, in which the generation of a disruptive impulse by the first or initiative explosion, which is communicated with extreme rapidity to contiguous masses of the same nature, appears much more likely to be the operating cause, than that such simultaneous explosions should be brought about by the direct operation of heat and mechanical force.

A practical examination has been instituted into the influence which the explosion of gun-cotton through the agency of a detonation, exercises upon the nature of its metamorphosis, upon the character and effects of its explosion, and upon the uses to which gun-cotton is susceptible of application.

III. "Results of Magnetical Observations made at Ascension Island, Latitude 7° 55′ 20″ South, Longitude 14° 25′ 30″ West, from July 1863 to March 1866." By Lieut. Rokeby, R.M. Reduced by G. M. Whipple, Magnetical Assistant at the Kew Observatory. Communicated by B. Stewart, LL.D. Received March 11, 1869.

On leaving England for Ascension Island in May 1862, Lieut. Rokeby was supplied by General Sabine with the following instruments for the purpose of making observations of magnetical variation and intensity, viz.:—

A portable declinometer and unifilar for absolute observations of declination and horizontal intensity, a Barrow's dip-circle (No. 24), a differential declinometer, and a differential bifilar.

The differential declinometer and the bifilar were erected at George Town, Ascension, in August 1862, and bihorary observations commenced; but in consequence of instability in the supports of the instruments, caused probably by the shifting of the volcanic cinders which formed the ground at the observing-station, the observations made exhibit frequent discrepancies. The whole of the bifilar observations, and all the differential declinometer observations prior to June 1864, have therefore been omitted from the present discussion.

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These observations were discontinued in June 1866, when Lieut. Rokeby left the Island.

Observations of absolute horizontal force and dip were made on the Green Mountain, Ascension, once every month from July 1863 to March 1866, two months in 1865 excepted.

Observations were not made with the portable declinometer.

Observations of Horizontal Force and Dip.

The horizontal, vertical, and total forces (Table No. 1) are calculated to English measure; one foot, one second of mean solar time, and one grain being assumed as the limits of space, of time, and of mass.

The vertical and total forces are obtained from the absolute measures of the horizontal force and the dip.

The observations of dip (Table No. 1) were made in every instance save one with the needle marked A 2.

For the observations of deflection and vibration taken each month for absolute measure of horizontal force, the same magnet (collimator 5) has always been employed.

The moment of inertia of the magnet, with its stirrup for different degrees of temperature, and the coefficients in the corrections required for the effects of temperature and of terrestrial magnetic induction on the magnetic moment of the magnet, were determined in 1858 at the Kew Observatory by the late Mr. Welsh.

That these corrections held good in 1862 was proved by the agreement of the horizontal force obtained at Kew with this instrument previous to its departure, with the value of the force determined by the observatory unifilar.

The moment of inertia of the magnet with its stirrup is 5·3828 at 60° Fahr.

The induction-coefficient $\mu = 0{\cdot}000252$.

The correction for error of graduation of the deflection-bar at 1·0 foot is 0·00000 foot, and at 1·3 foot 0·00003 foot.

The formula used for determining the temperature correction was

$$q\,(t_0 - 35^\circ) + q'\,(t_0 - 35^\circ)^2,$$

where t_0 is the observed temperature, 35° F. being the adopted standard temperature.

The values of q and q' for the magnet used are respectively 0·00011035 and 0·000000581.

The observed times of vibration have been corrected for rate of chronometer when it has exceeded five seconds per day. A correction has also been applied for the effect of torsion on the suspending thread.

The initial and terminal semiarcs of vibration have always been less than 30′, consequently no correction was requisite on this account.

The time of one vibration is derived from the mean of twelve observations of the time of 100 vibrations.

Rokeby & Whipple. Proc. Roy. Soc. Vol. XVII. Plate VIII.

Annual and Semi-annual Means of the Diurnal Variation of the Declination.

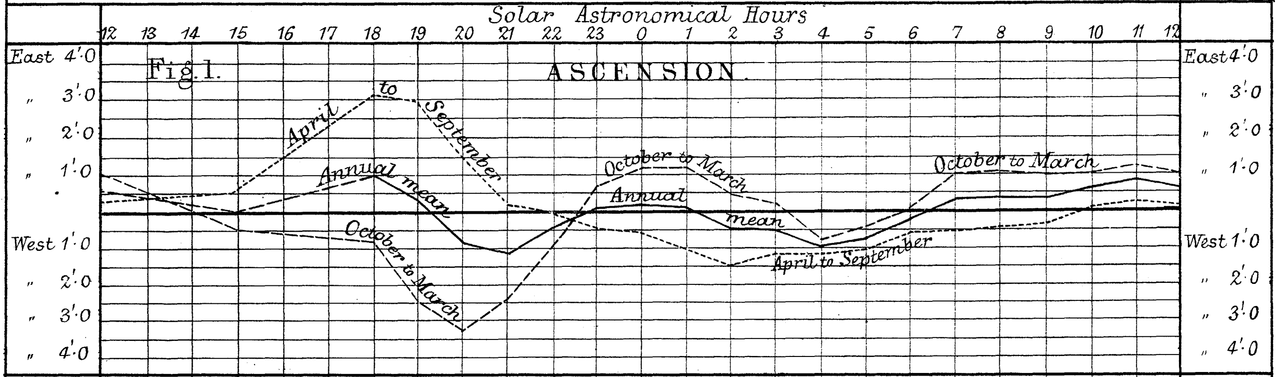


Fig. 1.

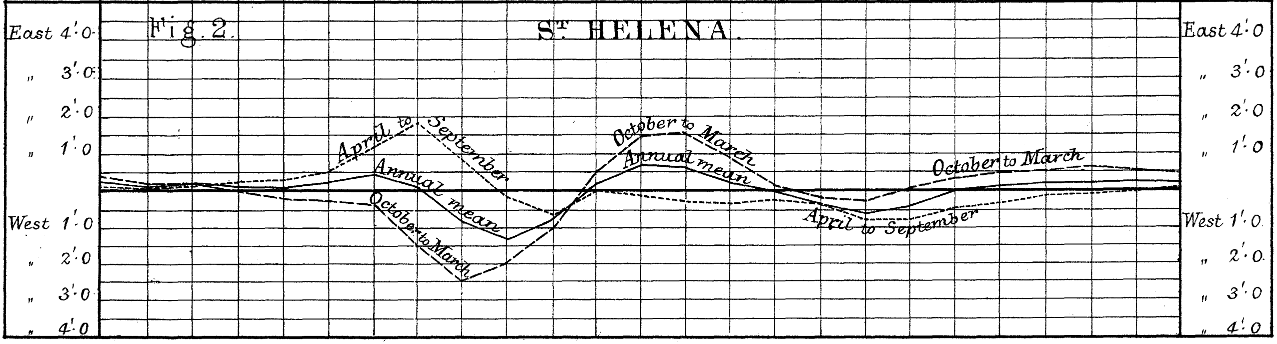


Fig. 2.

Semi-annual Inequality of the Solar-diurnal Variation of the Declination.

Fig. 3. **ASCENSION**

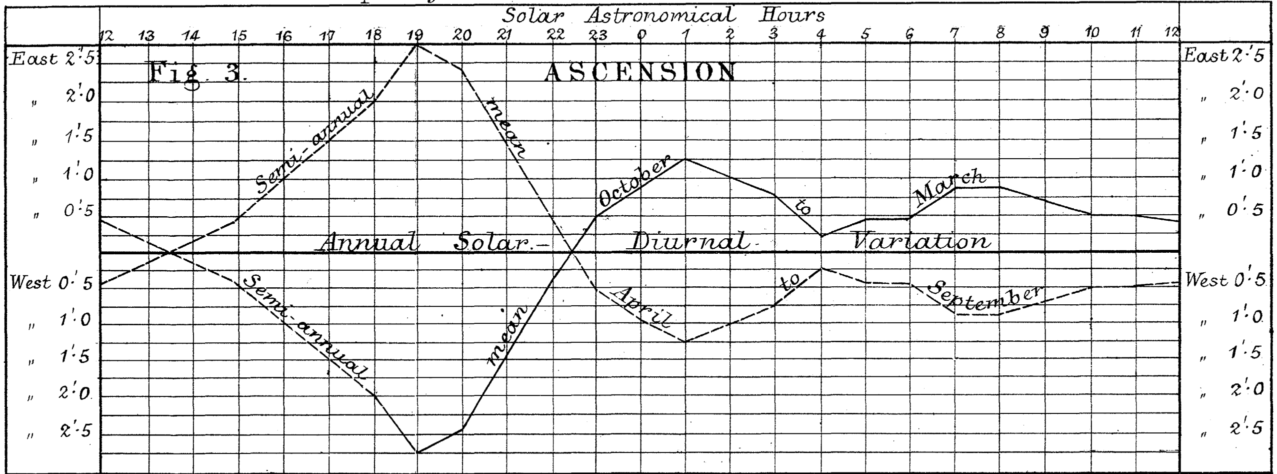
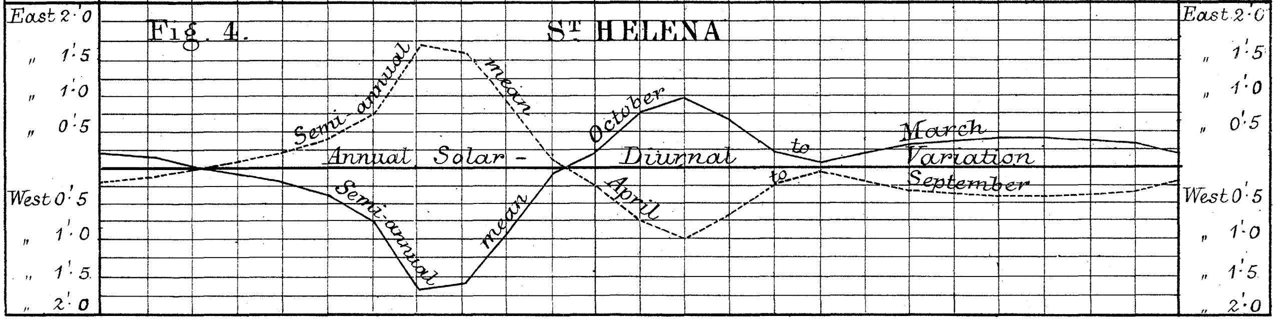


Fig. 4. **S^T HELENA**



G. M. Whipple delt.

The angles of deflection given are each the mean of two determinations.

In deducing from these observations the ratio and product of the magnetic moment m of the magnet, and the earth's horizontal magnetic intensity X, the induction- and temperature-corrections have always been applied.

In calculation of the ratio $\frac{m}{X}$, the third and subsequent terms of the series $1+\frac{P}{\gamma^2}+\frac{Q}{\gamma^4}+$ &c. have always been omitted. The value of the constant P was found to be $-0{\cdot}00291$, by the mean of ten determinations obtained each from six pairs of deflection-observations at distances 1·0 and 1·3 foot.

The mean of the values of $\frac{m}{X}$ derived from deflection-observations at the distances 1·0 foot and 1·3 foot has been used in calculating the measure of horizontal force.

Observations made with the Differential Declinometer.

Observations were made of the scale-reading of the differential declinometer at 3 A.M., and hourly from 6 A.M. to midnight, daily, from December 1863 to June 1865, from which date to the conclusion of the series the 3 A.M. observations were discontinued.

The observations from the commencement until May 1864 were found on inspection to be valueless for the purposes of reduction, for the reason assigned in the introduction.

The two years' records, June 1864 to 1866, were treated according to the method employed by General Sabine in the reduction of declination-observations.

In the first place, hourly means were taken for each month. All observations which vary from these means to a greater extent than 4'·0 were then rejected, and new means taken of the unrejected observations.

The mean reading for each month was then computed; finally, the hourly means were subtracted from the monthly means.

Table 2 shows these differences as derived from the mean of two years' observations, excepting in the case of 15 hours, which is the result of one year only.

In the Table, the sign + represents the north pole of the magnet to the east of the mean position, and the sign — that it was to the west of the mean.

At the bottom of the Table semiannual and annual means are given, and these means are exhibited in the form of curves in the diagram accompanying the paper.

Figure 1 shows the differences of the semiannual and annual means from the normal position, which is represented by the straight horizontal line.

In figure 3 the annual mean is represented as a straight line, and the curves show the deviations of the semiannual means from it. In both figures the curves between twelve and fifteen hours and fifteen and eighteen hours are interpolated.

Figures 2 and 4 are copied from General Sabine's St. Helena Observations, vol. ii., and show the similarity between the movements of the magnet at Ascension and St. Helena.

The Tables annexed to this Paper are preserved for reference in the Archives.

April 22, 1869.

JOSEPH PRESTWICH, Esq., Vice-President, in the Chair.

Alphonse DeCandolle, of Geneva, Charles Eugène Delaunay, of Paris, and Louis Pasteur, of Paris, were proposed for election as Foreign Members, and notice was given from the Chair that these gentlemen would be ballotted for at the next Meeting.

The following communications were read :—

I. "Description of *Parkeria* and *Loftusia*, two gigantic Types of Arenaceous Foraminifera." By Dr. Carpenter, V.P.R.S., and H. B. Brady, F.L.S. Received March 18, 1869.

(Abstract.)

The Authors of this Memoir commence by referring to the separation of the series of *Arenaceous* Foraminifera from the *Imperforate* or *Porcellanous*, and from the *Tubular* or *Vitreous*, first distinctly propounded in Dr. Carpenter's 'Introduction to the Study of the Foraminifera' (1862), on the basis of the special researches of Messrs. Parker and Rupert Jones; who had pointed out that whilst there are several genera in some forms of which a cementation of sand-grains into the substance of the calcareous shell is a common occurrence, there are certain genera in which a "test" formed entirely of an aggregation of sand-grains takes the place of a calcareous shell; and that these genera constitute a distinct Family, to which important additions might probably be made by further research.

The propriety of this separation of the *Arenacea* from the calcareous-shelled Foraminifera has been fully recognized by Prof. Reuss, the highest Continental authority upon the group; who had come to accept the principle laid down in Dr. Carpenter's successive Memoirs (Phil. Trans. 1856–1860), that the *texture of the shell* is a character of fundamental importance in the classification of this group, the *plan of growth* (taken by M. d'Orbigny as his primary character) being of very subordinate value; and who had, on this basis, independently worked out a Systematic Arrangement of the entire group, which presents a most remarkable correspondence with that propounded by Dr. Carpenter and his coadjutors. And their anticipation of important additions to the Arenaceous series has